Reasons Behind Program Delays

Summary

- Program delays are common; the reasons behind the delays are varied
  - Problems conducting the test
    - Test range availability, test instrumentation problems, and test execution problems
  - Performance problems in DT or OT
    - System problems identified during testing that must be addressed
  - Programmatic
    - Funding or scheduling problems
  - Manufacturing
    - Manufacturing delays or quality control problems

Program	Delay	Manufacturing	Programmatic	Performance Problems in DT	Performance Problems in OT	Problems in Conducting Test	Problem Observed Conducting Test
Joint Strike Fighter	FRP delayed 3 years	1	1	1			
P-8A Poseidon	MS C delayed 18 months	1				1	improper instrumentation during DT
AIM-9X 8.212	OT completion delayed 18 months			1	1		
AARGM	FRP delayed over 2 years	1		1	1		
CIRCM	FRP delayed 4 years			1			
IDECM Block 3	FRP delayed 5 years	1		1	1		
LAIRCM Phase II	FRP delayed over 4 years		1	1			
SIRFC	FRP delayed over a year	1	1	1	1		
AOC-WS 10.1	Fielding delayed one quarter			1			
MIDS JTRS	FRP delayed about a year	1		1	1		
Mark XIIA Mode 5	FRPD delayed 3 years			1	1		
DoN LAIRCM	MS C delayed a year		1		1		
MALD	IOT&E delayed over 3 years			1	1	1	range availability
B-2 RMP	FRP delayed 2 years	1					
RMS	FRP delayed 9 years		1	1	1		
ALMDS	FRP delayed 4 years			1			
MH-60S Block 2A AMCM	FRP delayed over 4 years			1	1		
AMNS	FRP slipped over 6 years			1			
LPD 17	MS III delayed 3 years	1			1	1	targets
SM-6	FRP delayed a year			1		1	telemetry
LCS	FOC delayed a year	1	1				
Virginia	MS III delayed 2 years	1	1	1	1	1	targets
DDG 1000	MS B rescinded		1				
CH-47F	FRP delayed 3 years		1	1	1		
AH-1Z	FRP delayed over 4 years	1		1	1		

Program	Delay	Manufacturing	Programmatic	Performance Problems in DT	Performance Problems in OT	Problems in Conducting Test	Problem Observed Conducting Test
Spider Networked Munition	FRP delayed 6 years				1		
Precision Guidance Kit (PGK)	MS C delayed 4 years			1			
Excalibur Increment Ia-2	FRP delayed over 2 years		1	1			
PIM	MS C delayed 3 years		1	1			
JLTV	MS C delayed over 2 years		1	1			
E-IBCT	3 of 5 systems cancelled			1	1		
JTRS HMS Rifleman Radio	MS C, FRP delayed 2 years			1	1		
Gray Eagle	FRP delayed over 2 years		1		1		
Stryker MGS	FRP delayed over 3 years	1			1		
Net-Centric Enterprise Services	FRP delayed 2 years		1		1	1	lack of user base
NPOESS	FRP delayed 2 years		1	1			
GCCS JOPES 4.2 and 4.2.1	Fielding delayed 2 years			1	1		
CITS AFNet Increment 1	Fielding delayed 2 years		1	1	1		
Patriot PAC-3	FRP delayed 15 years		1		1		
MEADS	LRIP delayed 9 years		1	1			

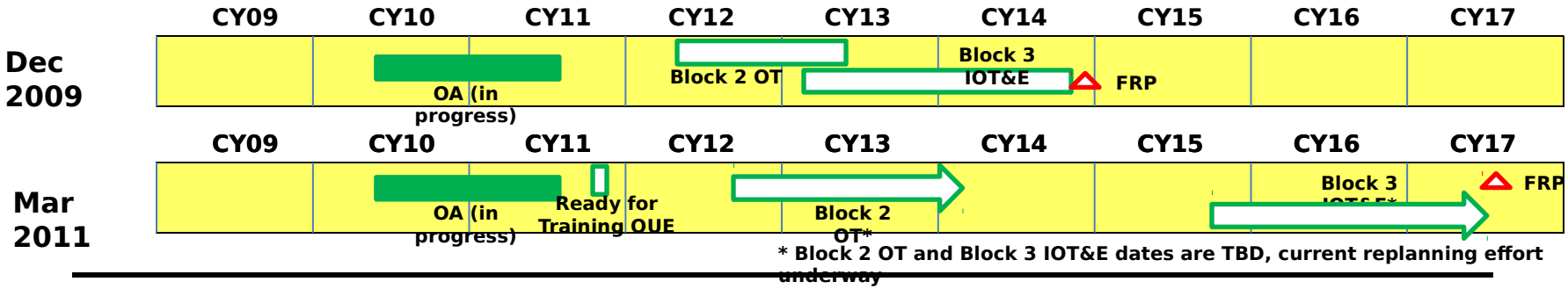
Conclusions

- Problems in conducting tests occasionally contributed to program delays, but problems found during both DT and OT testing frequently caused program delays
- Programmatic problems were also common

Outline

- Air Warfare Examples
- Naval Warfare Examples
- Land Warfare Examples
- Net-Centric Examples
- Missile Defense Examples

Joint Strike Fighter (F-35)

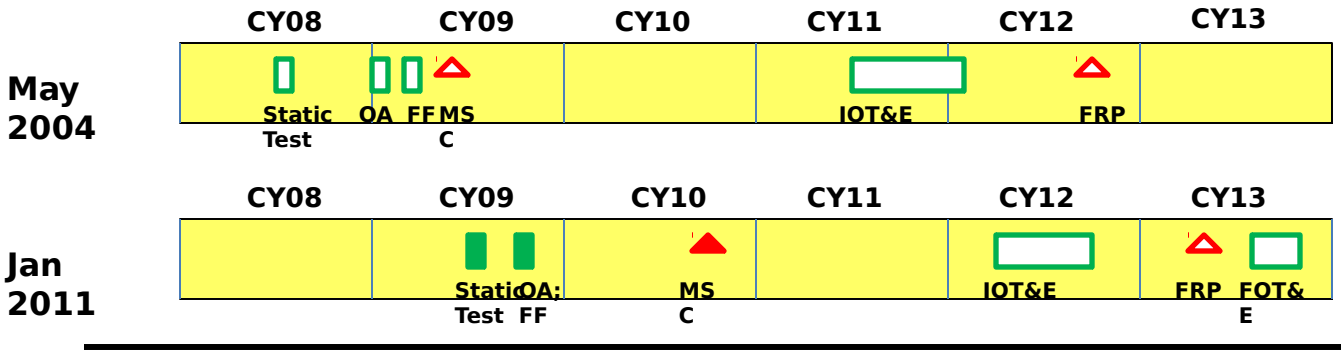


- **SDD and key program milestones have been extended three times from the baseline dates in the current TEMP (approved Dec 2009)**
- **Feb 2010 Restructuring:**
  - **Causes: delayed delivery of test aircraft due to extended manufacturing time, unrealistic planning assumptions for flight test progression, inadequate contractor staffing levels, insufficient software and integration lab facilities**
  - **Impacts: extend SDD 13 months, move MS C to Nov 2015, lower production (122 fewer aircraft procured in FY11-15 compared to FY10 PB baseline)**
- **Nunn-McCurdy Recertification:**
  - **Process validated Joint Estimating Team cost and schedule models, endorsing need for further schedule slip**
  - **Late ferry dates of test aircraft (209 days total for first six SDD aircraft) and slow progress in STOVL flight sciences highlighted**
  - **Impacts: SDD completion moved to FY16**
- **Secretary of Defense FY12 Budget Decisions – based on Technical Baseline Review**
  - **Immaturity of STOVL design and unexpected component deficiencies inhibited DT progress**
  - **Development of mission systems software continues to lag program schedule, forcing delays in DT**
  - **Fly rates per month lowered to more realistic projections (from 12 max for all variants and venues to 10 max for CTOL/CV flight sciences, 9 max for STOVL flight sciences, 8 max for all mission systems); increased planning factors for re-fly and regression (up 15% for flight science, 10% for mission systems); more time required for software development and incremental builds**

Proposed Test Event **Completed Test Event** **Proposed Decision Point** **Completed Decision Point**

P-8A Poseidon

Multi-mission Maritime Aircraft, replacement for P-3

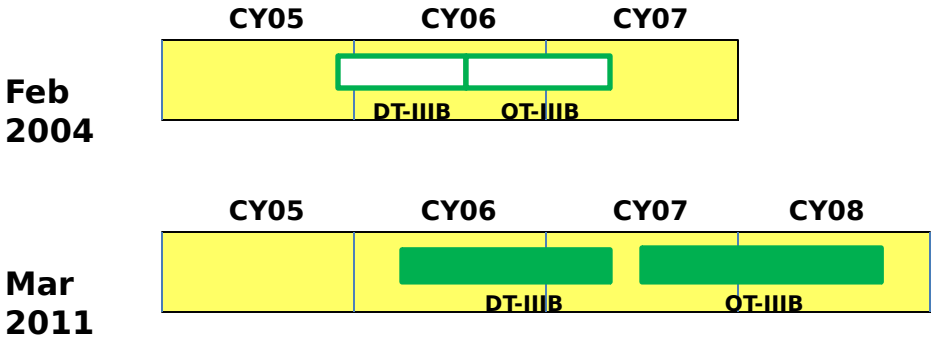


- **FY09 MS C was delayed 18 months for the reasons listed below**
- **First flight (FF) and the start of developmental flight testing was delayed by 10 months due to delays in completing the aircraft design drawings and building the test aircraft**
- **During developmental flight testing, problems with instrumentation in the airworthiness flight test aircraft (T-1) caused additional delays and reduced the number of completed flights prior to original MS C**
  - **Flight tests on the mission systems (T-2) and weapons drop (T-3) test aircraft also were delayed**
- **The prime contractor, underestimated the complexities of and time required for the static load testing, which delayed the start of testing by 12 months and extended testing by 7 months**
  - **In static load testing, improper loading of some aircraft components caused premature failure and a need to re-test**

Proposed Test Event **Completed Test Event** **Proposed Decision Point** **Completed Decision Point**

AIM-9X 8.212 Software Upgrade

Sidewinder Missile

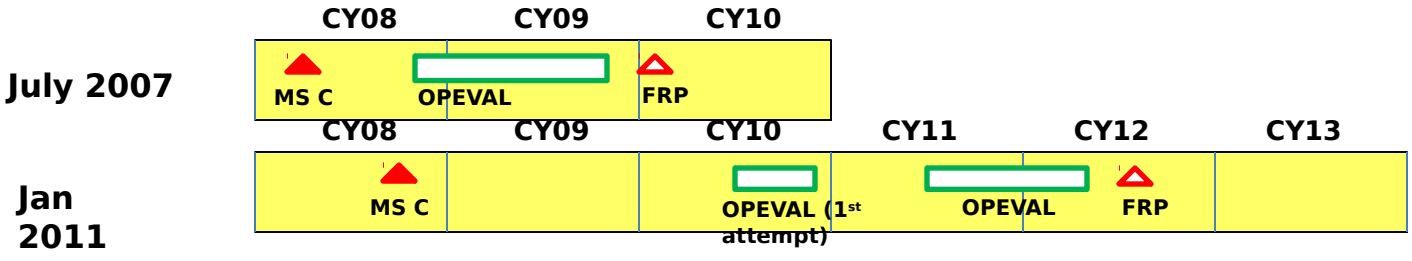


- **OT completion was delayed about 18 months for the reasons outlined below**
- **In DT, two areas caused additional program effort**
  - Surface Attack – an attempt to develop a residual capability against moving ground vehicles added testing. In the end, the program office did not certify the capability for OT
  - Lock-On After Launch capability was tested in both DT and OT. However, it was not certified for warfighter use because of fratricide concerns
- **In OT, the program had two software problems that led to an 11-month pause in OT**
  - One software problem caused an unexpected reduction in acquisition range relative to earlier versions
  - One software problem was a near-divide-by-zero that produced wild initial missile motion and created a safety-of- flight problem with the F-16
- **Both OT problems were fixed, and 8.212 was fielded after OT-III B**
  - Lock-On After Launch is currently planned for OT in version 9.3

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Advanced Anti-Radiation Guided Missile (AARGM)

A dual-mode guidance section on a HARM airframe

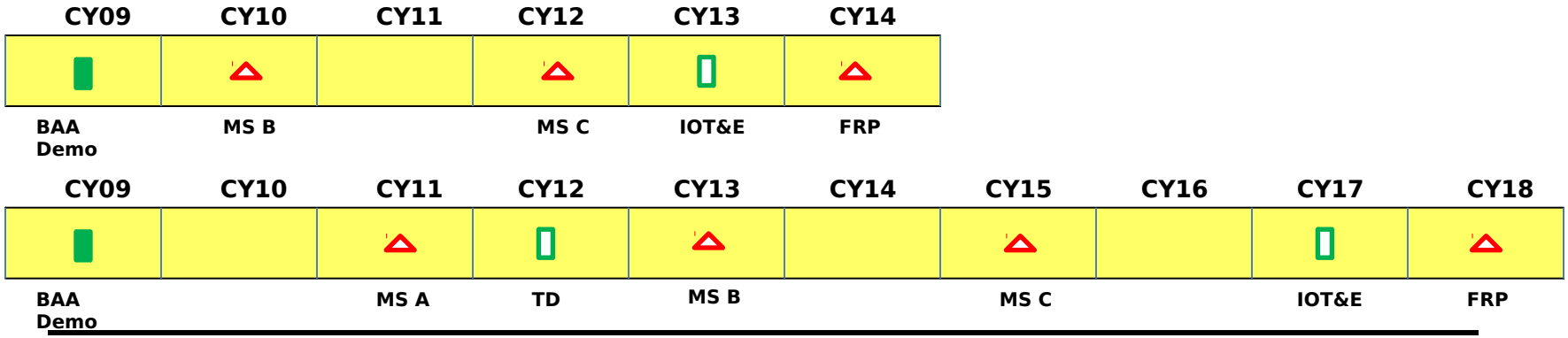


- **Schedule delays were due to several factors:**
  - Problems discovered during system development phase led to changes in missile subsystem designs
  - Sub-tier supplier quality control problems led to delays of 6 months to 1 year, and in a few instances led to qualifying new sub-tier suppliers (delays up to 1 year)
  - Delays in validating targets led to a slowdown in engineering tests and DT
  - Test aircraft availability and test range scheduling also introduced lesser program delays
- **Discovery of problems in DT and in operational assessment (OA) was limited by a reduction in scope of test (in part due to known deficiencies in the missile system)**
- **OPEVAL(1st attempt) terminated early because of the discovery/occurrence of eight anomalies and the scoring of seven Operational Mission Failures (OMF) in a 3-month period (Jun-Aug 2010), which were in large part the result of reliability problems and system deficiencies**
- **OPEVAL deferred to fix known problems and system deficiencies discovered mostly in engineering tests and to a lesser extent problems discovered in DT and OA**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Common Infrared Countermeasure (CIRCM)

Countermeasures against IR-guided missile threats

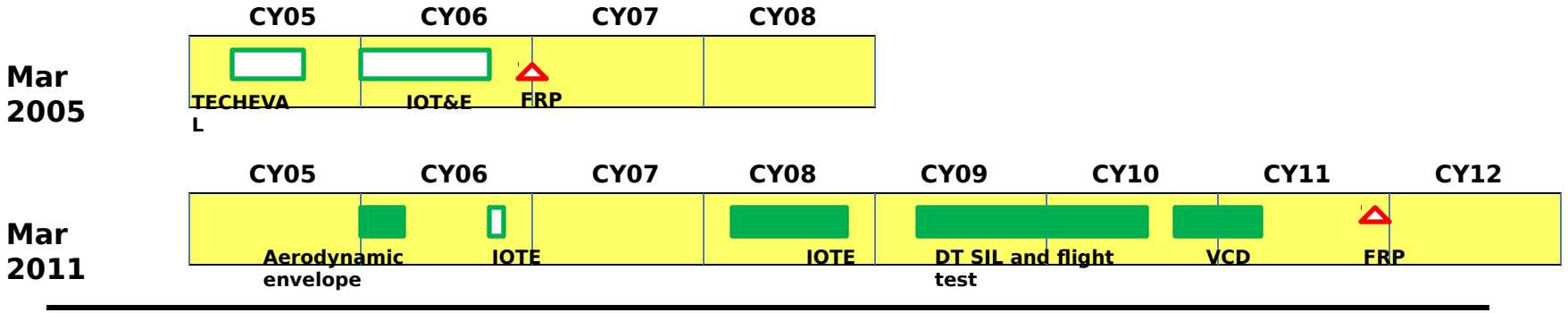


- **The Broad Area Announcement (BAA) Demonstration Test in 2009 was originally planned to:**
  - **Demonstrate mature technologies (TRL 6) for fiber optic transmission of jamming laser energy and a small and lightweight pointing and tracking system suitable for application on helicopters**
  - **Provide test results to inform an MS B and down-select decision in 2010**
- **The BAA Demonstration proved that the technologies were not mature**
- **OSD decided that a formal MS A and Technology Development (TD) Phase was required**
- **The outcome of the initial BAA Demonstration Test has delayed the FRP 4 years due to the lack of proven technology**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Integrated Defensive Electronic Countermeasures

RF countermeasures suite for Navy F/A-18 aircraft

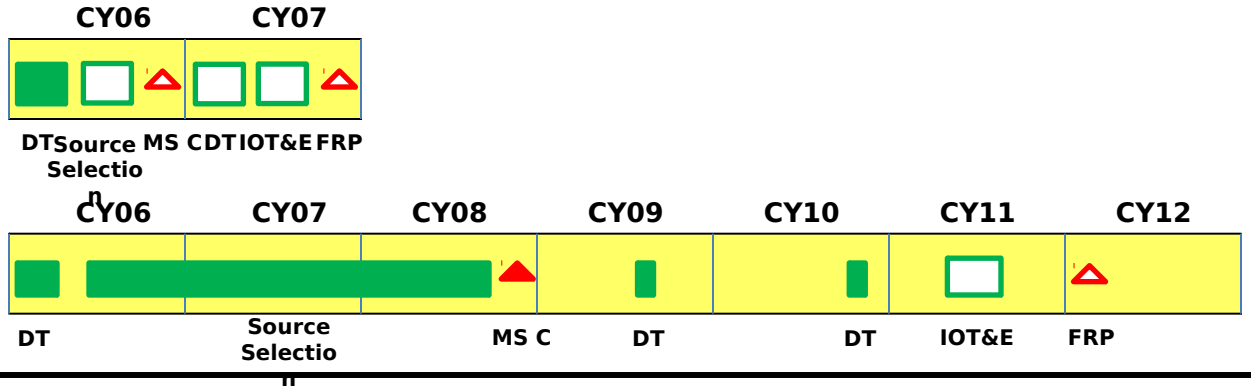


- **Original IDECM program was scheduled for IOC in 2000**
- **Program separated into blocks in 2001 to provide incremental capability**
- **Block 3 IOT&E was delayed, started, stopped, re-started, then additional testing was conducted to confirm correction of major deficiencies**
  - **2QFY06: Towed decoy aerodynamic envelope had to be reexamined**
  - **Aug 2006 IOT&E: Flight testing stopped after four flights for safety (decoys hit aircraft)**
  - **Feb to Sept 2008 IOT&E: Effective and not suitable (safety and reliability)**
  - **1– 2QFY11 Verification of Correction of Deficiencies (VCD): Initial analysis indicates safety issues and reliability improved**
- **Major Deficiencies**
  - **Towed decoy deployment safety and reliability failures**
  - **Towed decoy could not be severed due to hardware design flaws**
  - **Control logic errors led to uncommanded towed decoy deployments**
  - **Very high built-in test false alarm rate caused unnecessary maintenance and the likelihood that good decoys would be severed**
- **Intensive software and hardware corrections and structured testing appear to have resolved many issues**
  - **IOT&E and VCD testing will support a DOT&E BLRIP Report and FRP decision 3–4QFY11**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Large Aircraft Infrared Countermeasures (LAIRCM) Phase II

Next generation Missile Warning System

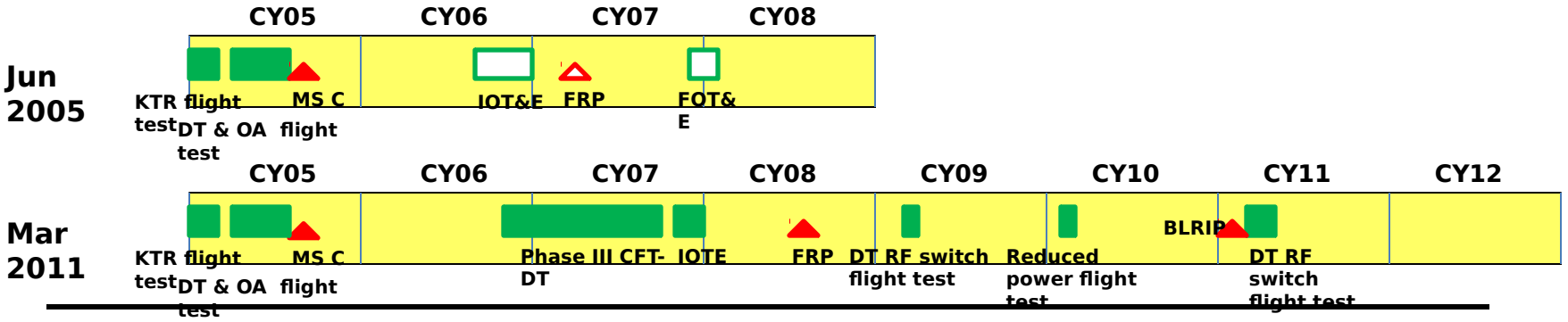


- **LAIRCM Phase II had planned for a quick source selection followed by a quick succession of test events leading to an FRP in 2007**
- **The source selection lasted two years instead of two quarters due to Air Force source selection and other contractual issues. The delay was not due to technical performance issues.**
- **DT in 2009 uncovered issues that had to be resolved and resulted in the (unplanned) 2010 DT test. However, other major contributing factors to the almost 3-year delay between MS C and IOT&E have been:**
  - **The Air Force LAIRCM system was delayed to enable the contractor to implement fixes to problems discovered by the Navy during DoN LAIRCM testing, which uses the same next generation missile warning system as the Air Force's system**
  - **A misunderstanding of the requirements for delivery of Technical Orders between the Program Office and the User caused additional delays in 2010.**
- **The outcome of the source selection and other factors cited above caused an approximate 4-year delay in the FRP decision.**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Suite of Integrated Radio Frequency Countermeasures

Threat warning and self-protection jamming for Army aircraft

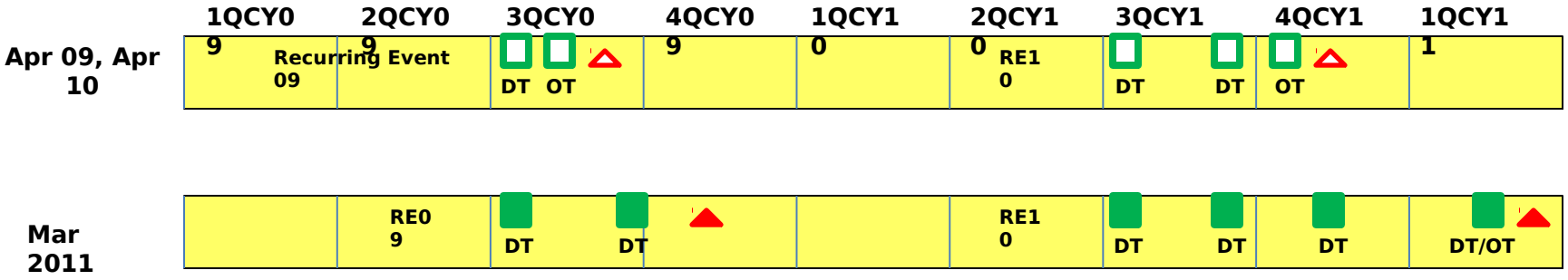


- **Original SIRFC program was scheduled for IOC in about 1999**
- **Army defunded program 2001, SOCOM took over program management**
- **IOT&E delayed to address low-band antenna and RF limiter hardware shortfalls**
  - **IOT&E: BLRIP delayed pending resolution of RF switch failures; SOCOM determined system to be effective, but not suitable**
  - **2009-2010 DT: BLRIP states not effective, not suitable**
- **Major BLRIP Findings:**
  - **RF switch failures reduced reliability to <1/10 of requirement**
  - **Laboratory test fixture did not replicate aircraft installation**
  - **RF countermeasures did not reduce the number of shots or the probability of hit per shot sufficiently "to provide necessary performance required for adequate survivability"**
  - **RF countermeasures transmitted power and/or techniques were insufficient**
  - **Radar Warning Receiver (RWR) sub-system was operationally effective and suitable**
- **Substantial re-design of RF switch and improvements in test methods**
  - **RF countermeasures sub-systems were suitable when redesigned RF switch tested**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Air & Space Operations Center – Weapon System (AOC-WS) 10.1

Air Component Commander's Command and Control System

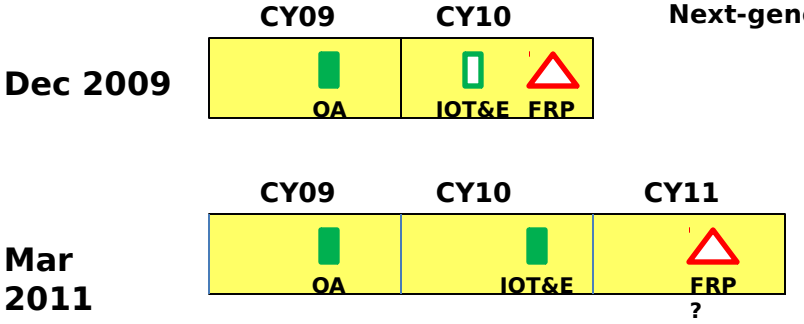


- **Program integrates/fields over 40 third-party software systems to the AOCs. Integration and interoperability among these diverse systems have delayed achieving full operational capability by about a year and have required sustainment upgrades**
- **Program is trying to use Global Command and Control System for its intelligence and targeting solution**
  - Deficiencies identified in Developmental Testing: Joint Targeting Toolbox, which is a third-party application within GCCS, is not integrated with Intelligence & Imagery (I3) suite of applications
- **Recurring Event 09 (RE09) Operational Test cancelled**
  - Only a few very low risk updates were fielded
- **Recurring Event 10 (RE10) OT delayed, down-scoped to combined DT/OT**
  - DT/OT completed without GCCS upgrade (higher risk package)

Proposed Test Event | **Completed Test Event** | **Proposed Decision Point** | **Completed Decision Point**

Multifunctional Information Distribution System Joint Tactical Radio System (MIDS JTRS)

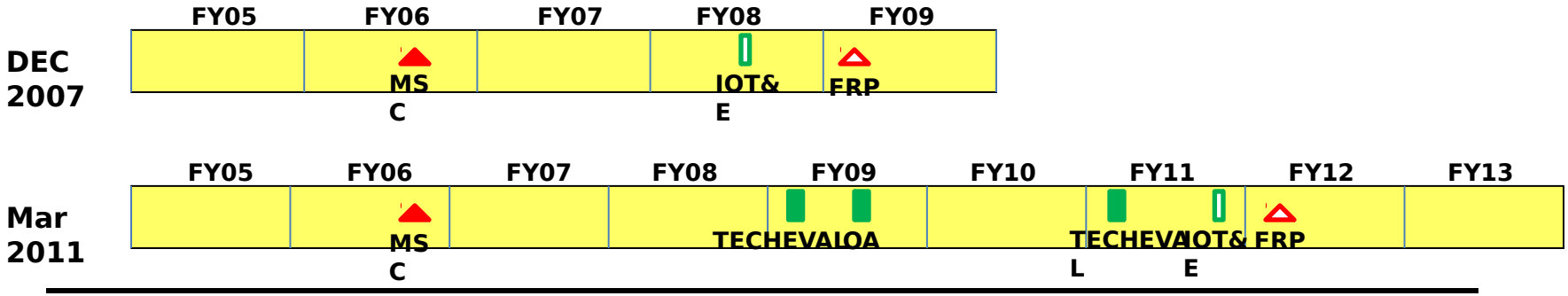
Next-generation voice-and-data radio



- **FRP has been delayed approximately one year due to performance problems during developmental testing and again during operational testing**
- **In the final Developmental Test events, the system appeared to function properly, and AOTR recommended proceeding to IOT&E**
  - **However, DOT&E found the MTBOMF_system to be 5.3 hours compared to an MTBOMF_system threshold of ≥25 hours**
  - **Program was not required to not execute a MIDS JTRS reliability growth program**
  - **Other performance problems included poor TACAN performance**
- **In Operational Testing, the MIDS JTRS as integrated into the F/A-18E/F exhibited failure modes not identified during Developmental Testing (BLRIP is in staffing at DOT&E)**
  - **One of two terminal vendors changed hardware configuration between end of Developmental Test and start of IOT&E and those terminals contributed to 80% of the terminal Operational Mission Failures. (This vendor was awarded all of the first lot production orders just ahead of start of IOT&E)**
  - **In addition, the vendor for the first production lot omitted to follow industry accepted standards for final test procedures prior to shipping the MIDS JTRS terminals to the IOT&E squadron—bypassing some tests**
  - **Emerging results indicated MIDS JTRS failed to meet System Reliability and Terminal Reliability threshold requirements**
  - **Developmental Test did not test all of the mission areas tested by the Operational Test squadron, for example, exchange of Close Air Support messages via MIDS JTRS Link 16 messages and standing up MIDS JTRS-equipped aircraft for the 7-minute alert status.**
- **Post IOT&E testing and new FRP Proposed Date**
  - **Program Manager is still trying to replicate some of the failures identified during IOT&E, has proposed fixes for some of the other failures and has stated Via Sat will be adhering to good production processes**
  - **The MIDS Program Manager is working with the OSD OIPT lead for development of new milestone date for FRP**

Mark XIIA, Mode 5 IFF

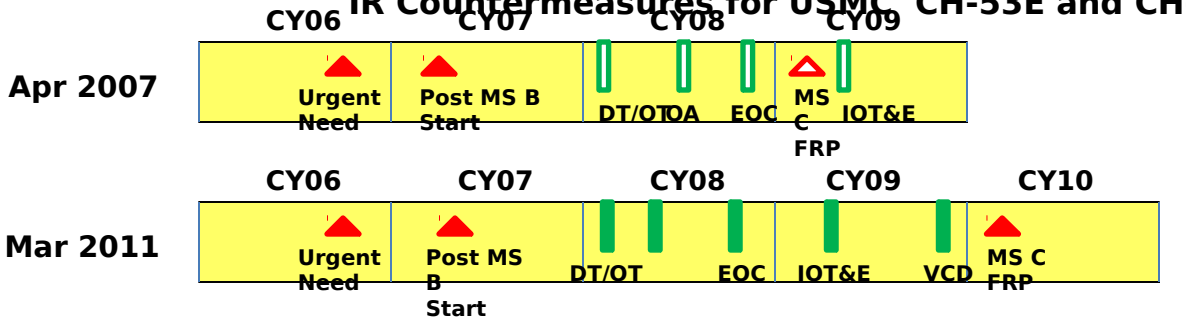
Identification, Friend or Foe System



- **IOT&E has been delayed progressively and is now 3 years late due to performance, suitability and Joint interoperability issues**
  - **Problems included false targets, false target IDs, target track swapping, mis-identifications, poor reliability, EKMS issues and test set availability**
- **Serious issues revealed in the July 2009 OA, led to a re-baselined program being approved by the MDA (Navy)**
  - **New program allowed 2-year period to identify and correct issues**
  - **Since then, extensive efforts have focused on rectifying documented deficiencies with notable success**
- **Preliminary results from March 2011 TECHEVAL, that included extensive Joint Service participation by all military services, provide confidence that planned Sep 2011 IOT&E will be successful**

Department of the Navy Large Aircraft Infrared Countermeasure System (DoN LAIRCM)

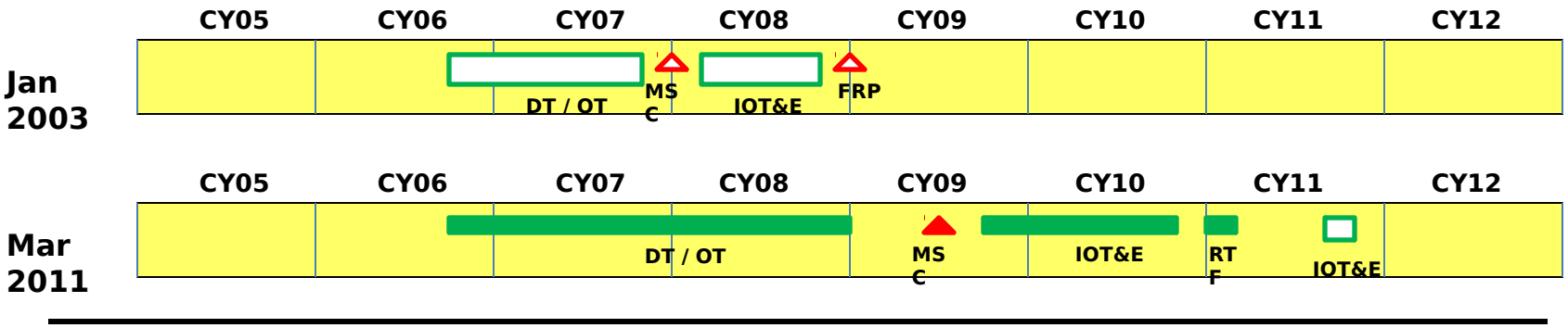
IR Countermeasures for USMC CH-53E and CH-46E



- **Initial Schedule Delay in 2006–2007 because of indecision on Acquisition Strategy: Quick Reaction Capability versus Formal Acquisition Program. Resulted in a combination of both.**
- **Obtaining assets for test was delayed because system was in early stages of production; only a few units were available.**
- **Delay in MS C/FRP was because of a major deficiency found in IOT&E.**
- **Because of the abbreviated test periods, suitability evaluations were minimal.**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Miniature Air Launched Decoy (MALD)

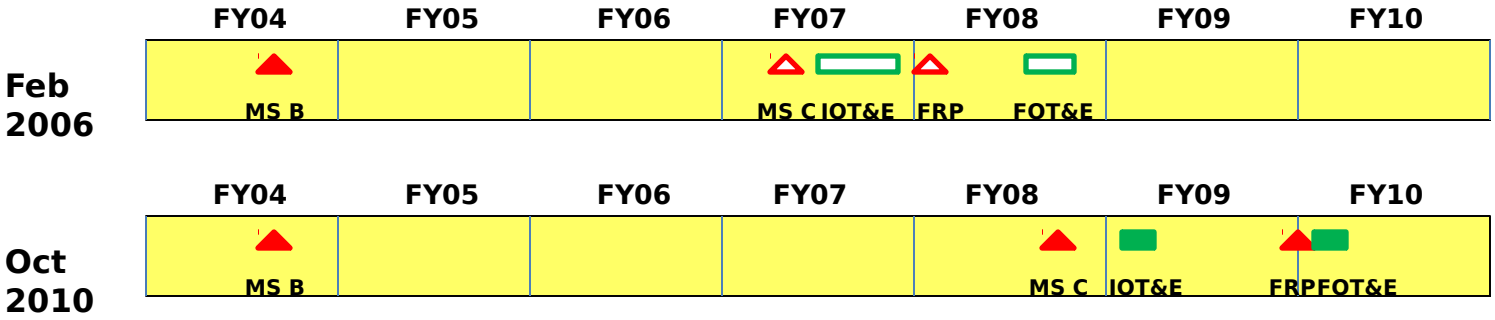


- **Developmental test extended following two early failures**
- **Both development and operational test schedules extended due to range availability**
  - **Only one DoD range with required electronic warfare test environment**
  - **Multiple DoD test and training requirements for test range with limited land, airspace, and personnel**
  - **Lack of qualified workforce on range results in delayed data analysis and data distribution (> 2 months)**
- **Additional tests required after critical failures occurred during IOT&E**
  - **Effective, but Not Suitable**
  - **MALD decertified during IOT&E**
  - **Return to Flight (RTF) mitigated**
  - **Manufacturing issues identified**
- **Quality of IOT&E uncovered two failure modes that would not have been discovered until the first day of combat**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

B-2 Radar Modernization Program

Replacement of B-2 Bomber's Original Radars



- **B-2 RMP FRP was delayed nearly two years by a manufacturing problem**
- **The program delay was caused by discovery of a manufacturing problem discovered outside of flight test**
  - **Separation between radar circulator subassemblies and radiator housing was caused by poor original choice of bonding material with mismatched thermal properties**
  - **The program was delayed for failure review, redesign, and laboratory testing of the new bond.**

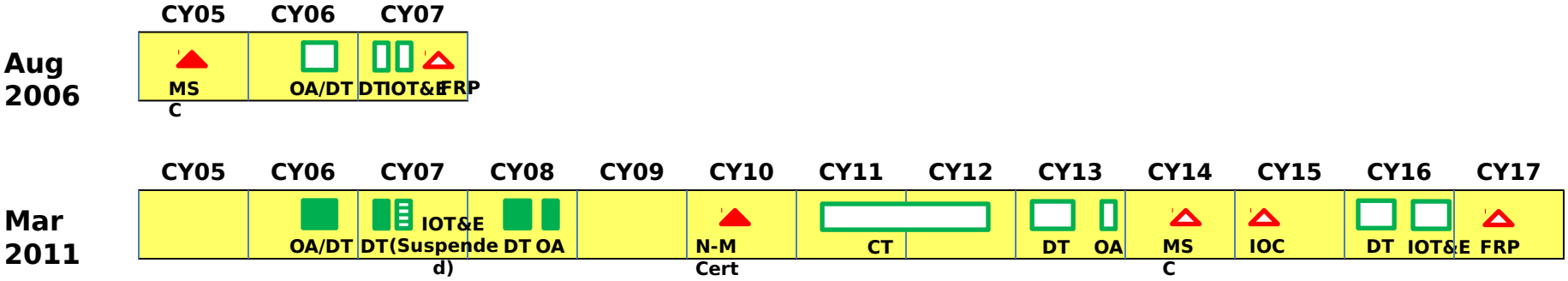
Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Outline

- Air Warfare Examples
- Naval Warfare Examples
- Land Warfare Examples
- Net-Centric Examples
- Missile Defense Examples

Remote Minehunting System

Remote vehicle and towed sensor; Component of
Littoral Combat Ship Mine Countermeasures Mission Package

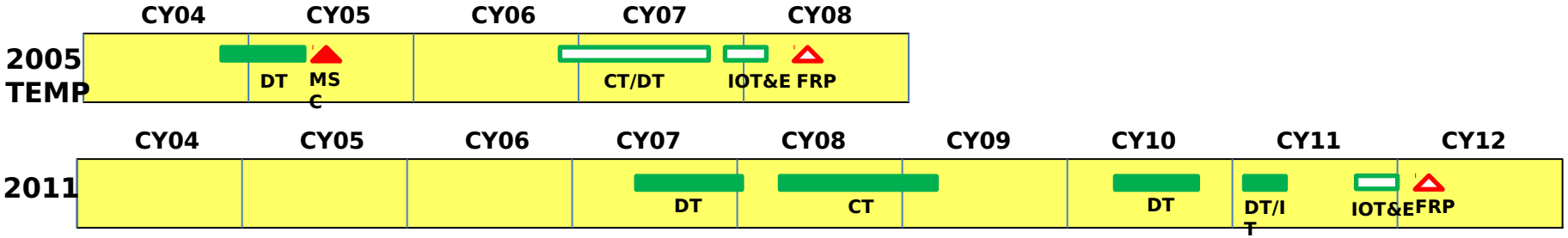


- **IOT&E and FRP have been delayed more than 9 years due to additional system development focused on improving vehicle reliability.**
- **Most of the system's technical parameters have been demonstrated under DT conditions, but reliability has been a recurring deficiency.**
  - **Current estimate of vehicle reliability is 20 to 45 hours MTBOMF compared to the 150-hour MTBOMF requirement for the system.**
- **During CY07 IOT&E attempt, system was decertified for test due to numerous reliability issues.**
- **IOT&E was rescheduled for FY08, but test was downgraded to an OA at the OTRR because of continuing concerns about reliability.**
- **The program was restructured in 2010 because of a critical Nunn-McCurdy cost breach.**
  - **MS C was rescinded and a new MS C established in CY14.**
  - **The reliability requirement was reduced from 150 hours MTBOMF for the <u>system</u> to 75 hours MTBOMF for the <u>vehicle</u>.**
  - **The program was directed to embark on a program to grow vehicle reliability to at least 75 hours MTBOMF.**

Proposed Test Event | **Completed Test Event** | **Proposed Decision Point** | **Completed Decision Point**

Airborne Laser Mine Detection System (ALMDS)

Component of LCS Mine Countermeasures Mission Package for Shallow Mine Detection

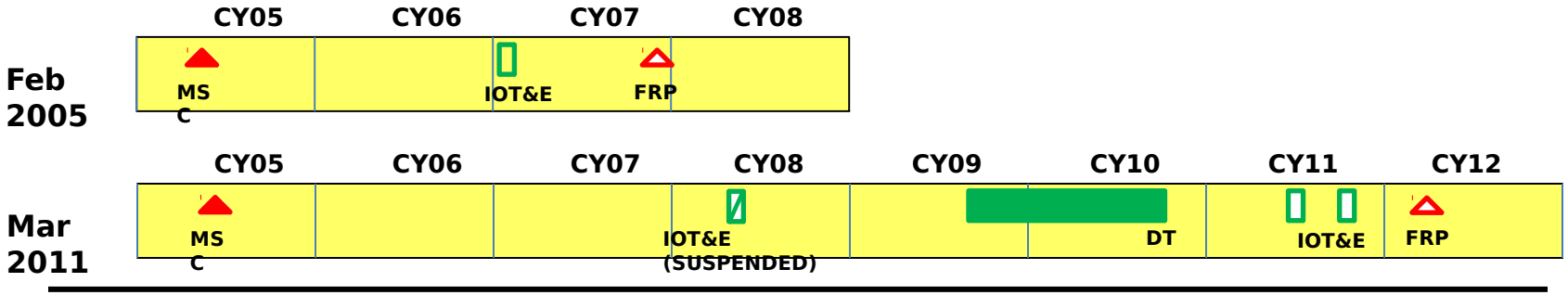


- **FRP delayed nearly 4 years because of developmental delays**
- **Problems revealed in DT**
  - Inability to meet depth requirement (partially mitigated by reducing first increment depth requirement to 70 percent of ORD requirement)
    - Current depth performance is about 67 percent of ORD requirement
  - Excessive false contact density
    - Program reports 183 percent of ORD limit
    - Potential “showstopper” in OT
  - Below threshold probability of detection and correct classification (currently 95 percent of ORD requirement)
  - Receiver failures
- **Problems found in DT reduced but not eliminated through hardware and software improvements**
- **No OT conducted to date**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

MH-60S Block 2A AMCM Helicopter with AN/AQS-20A Minehunting Sonar

Components of LCS Mine Countermeasures Mission Package

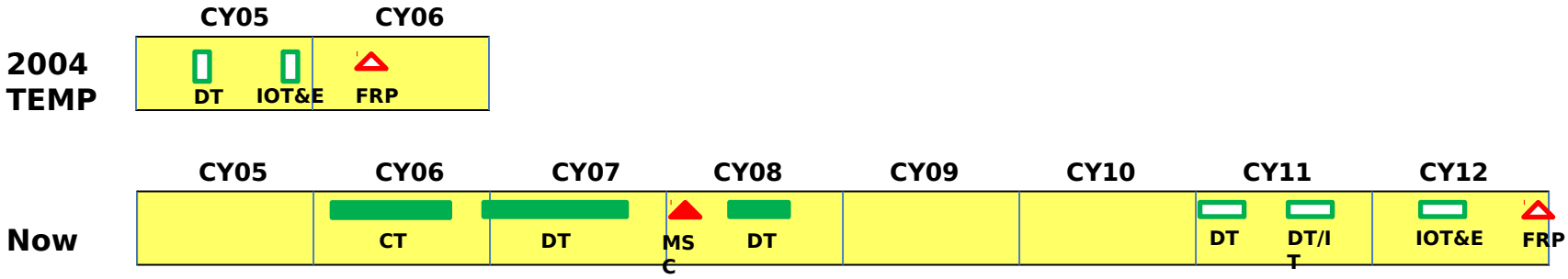


- **FRP Decision has been delayed more than 4 years because of system performance deficiencies.**
- **Commencement of 2007 IOT&E delayed until March 2008 because of tow cable/winch developmental issues.**
- **IOT&E suspended and system decertified from OT in April 2008 due to numerous system reliability deficiencies, primarily associated with tow cable and winch (cable mis-wrap on drum, jammed cable).**
- **Modifications incorporated and system re-entered DT in July 2009. DT officially completed in Aug 2010, but testing of fixes is continuing.**
  - **AQS-20A detection/localization performance not meeting technical requirements – sponsor contemplating ORD change.**
- **Shore-based phase of IOT&E expected to commence June 2011; LCS-based testing scheduled in Oct 2011**
- **FRP Decision anticipated in Feb 2012.**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Airborne Mine Neutralization System

Component of LCS Mine Countermeasures Mission Package

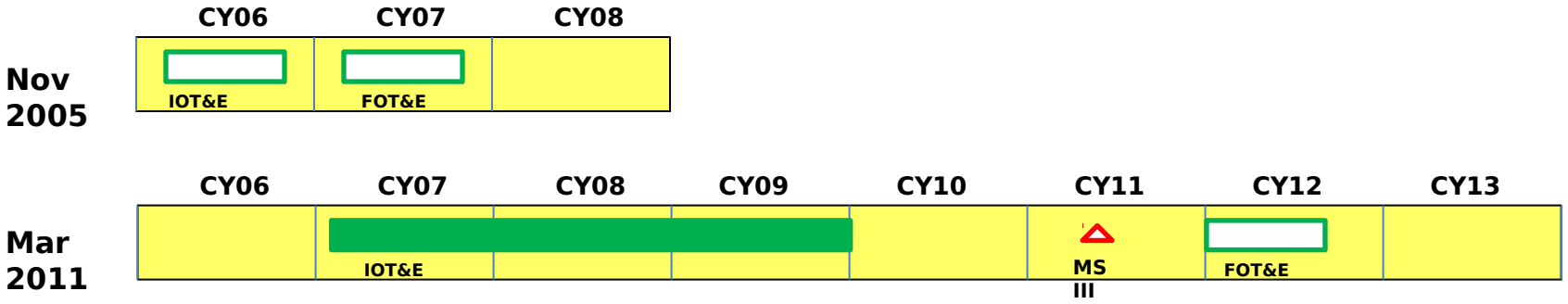


- **FRP slipped more than 6 years because of developmental delays**
- **Multiple problems encountered in CT and DT**
  - Neutralizers failed to launch when commanded
  - Tracking errors caused by excessive motion of Launch and Handling System
  - Difficulty passing fuze environmental performance tests (drop test)
  - Multiple neutralizer failures
  - Ethernet communications failures within Launch and Handling System
  - Software issues
  - Loss of Launch and Handling System in deep water (1,100 feet) – eventually recovered
  - Below-threshold probability of successful neutralization mission against bottom mines
  - Tow cable failures
- **No OT conducted to date**

Proposed Test Event **Completed Test Event** **Proposed Decision Point** **Completed Decision Point**

San Antonio (LPD 17) Class

Amphibious Transport Dock

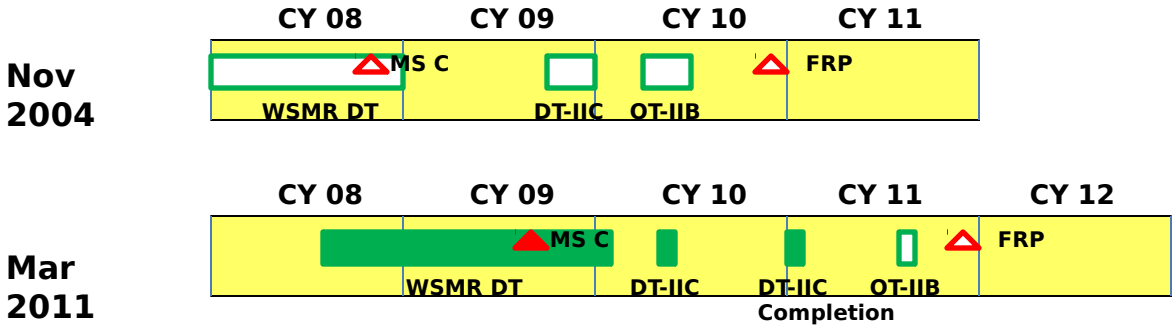


- **IOT&E start was delayed by one year due to the ship's poor materiel condition at delivery**
  - **LPD 17 delivered in July 2005 (Delivery threshold in original APB was Dec 2002)**
  - **March 2007 Navy Inspection described 193 of the ship's 943 spaces as unfinished and noted numerous materiel deficiencies to include:**
    - **Reverse Osmosis water production system was unreliable and could not support embarked forces**
    - **Ship Wide Area Network was unreliable**
    - **Ship's steering systems were unreliable**
    - **Cargo Weapon Elevators were unsafe**
    - **Two of the ship's three hinged vehicle ramps were inoperable**
- **LPD 17 deployed in August 2008; testing continued on LPD 18, LPD 19, and Self-Defense Test Ship**
- **Ship's materiel condition, ship schedule (e.g., extended post shake-down availability period), and the availability of test resources (e.g., aerial targets and Marines) delayed IOT&E completion**
- **June 2010 BLRIP report indicated that LPD 17 was not effective, not suitable, and not survivable in a combat environment primarily due to poor reliability of critical systems and combat system problems**
- **MS III decision is scheduled for April 2011 (Original APB scheduled MS III for Feb 2008)**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Standard Missile - 6 (SM-6)

Aegis ship surface-to-air missile

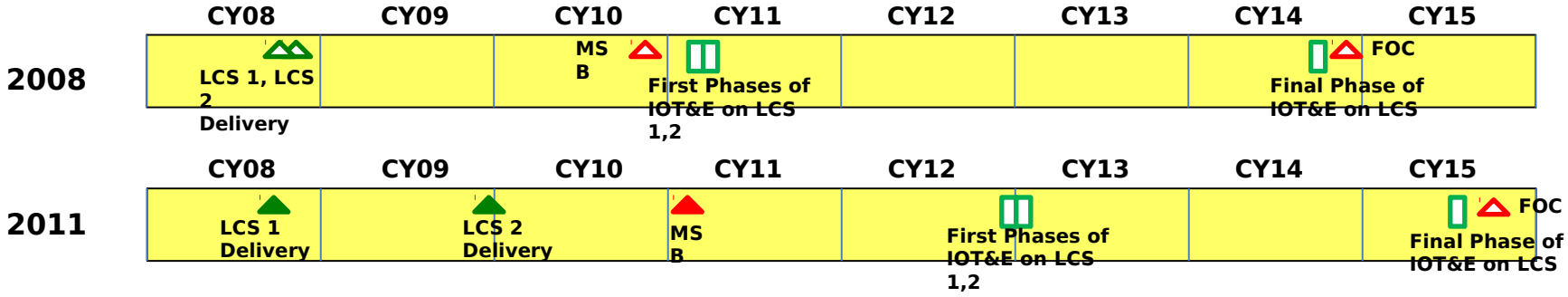


- **FRP has slipped one year because of developmental delays**
- **IOT&E delayed more than one year because of two significant performance failures, described below**
- **In DT at WSMR, a missile failed to launch because the missile computer fired both tactical seeker batteries early, causing electrical damage**
  - Missile circuitry was redesigned to protect against electrical surges
- **Two failures of the Target Detection Device delayed completion of DT-IIC until January 2011**
  - Failures were caused by test telemetry equipment that is not included in the tactical missile; software has been redesigned and ground tested to prevent recurrence
- **Problems discovered in past testing have not recurred once corrected**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Littoral Combat Ship (LCS)

High speed, shallow draft ships designed for operations in the littorals



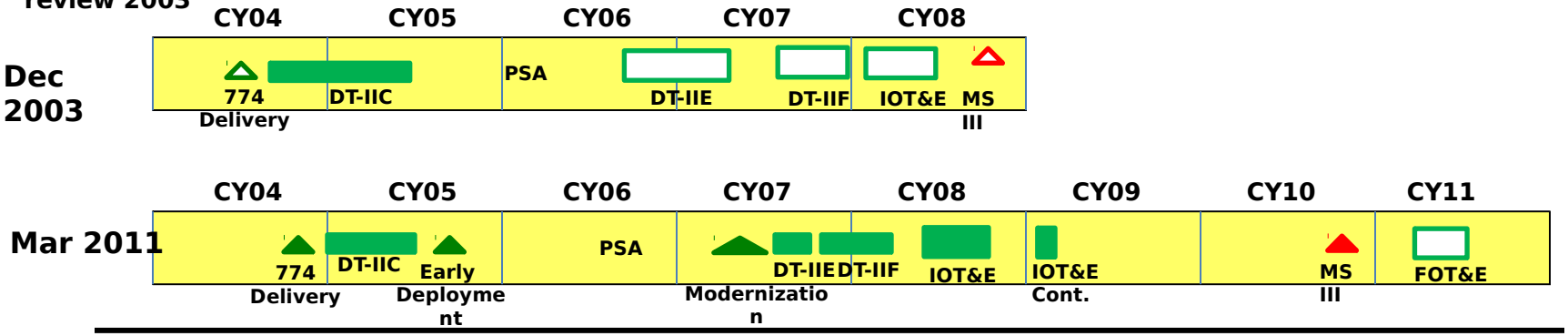
- **Start of IOT&E delayed nearly 2 years**
  - LCS 1 early deployment and participation in RIMPAC exercise delayed completion of post-delivery tests, trials, and DT
  - LCS 2 delivery slipped nearly 1 year because of construction delays and problems encountered during Builder's Trials (flooding and propulsion issues)
- **Completion of final phase of IOT&E and Full Operational Capability (FOC) will be delayed at least 1 year**
  - Initial phases of IOT&E will be conducted with incomplete mission packages.
  - Availability of complete mission packages will be delayed until at least 2015.
    - Mine Countermeasures Mission Modules behind schedule
    - Non-Line of Sight (NLOS) missile system cancelled; may delay availability of surface-to-surface missile capability for Surface Warfare Mission Package
    - Anti-Submarine Warfare Mission Package being reconfigured

Scheduled Program Event | Completed Program Event | Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Virginia (SSN 774) Class Submarine

Nuclear-Powered Attack Submarine

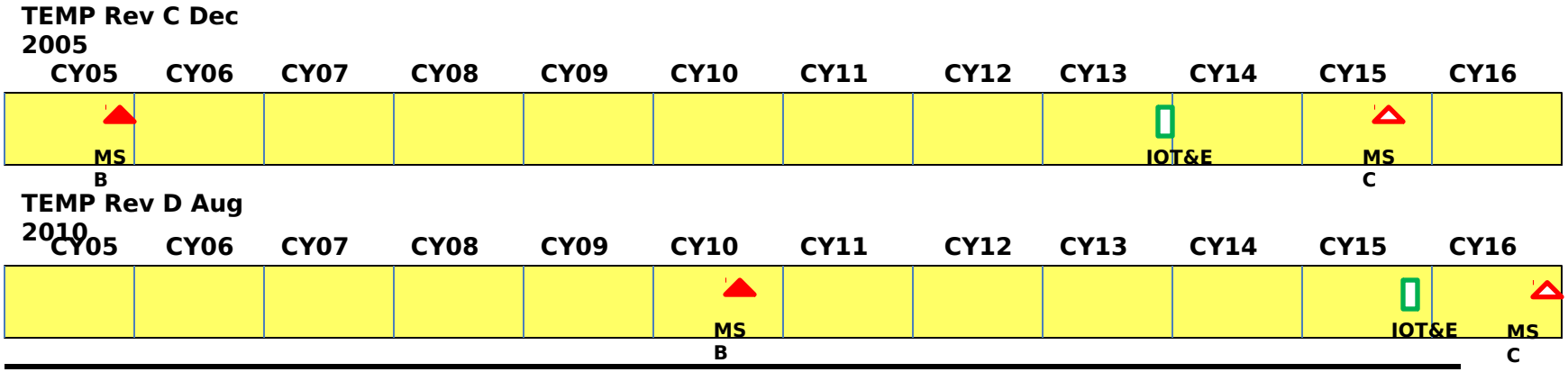
TEMP Rev D Oct 2002 and DAES review 2003



- **Addition of an early deployment soon after ship delivery, a modernization period, and a lengthy Post-Shakedown Availability (PSA) period contributed to schedule slip**
- **IOT&E start delayed by several months due to materiel and reliability issues discovered during TECHEVAL**
- **Completion of IOT&E delayed because of test ship materiel condition**
  - **USS *Virginia* experienced four fail-to-sails during IOT&E due to materiel reliability**
  - **Lead ship spent 2 months in dry dock to repair Main Seawater Valves**
  - **Test ship problems caused loss of scheduled target services and exacerbated delays**
- **DOT&E BLRIP report issued November 2009**
  - **Several missions/capabilities not tested as planned during 2008 IOT&E; FOT&E will be required**
  - **Testing to evaluate capability to conduct operations with Navy SEALs and Dry-Deck Shelter has been postponed to 2013; redesign of equipment required; unavailable test assets not yet available**

Scheduled Program Event | **Completed Program Event** | **Proposed Test Event** | **Completed Test Event** | **Proposed Decision Point** | **Completed Decision Point**

Zumwalt (DDG 1000) Class Destroyer



- **Original MS B decision rescinded by AT&L in June 2010 due to Nunn-McCurdy breach caused by increased unit cost when the total number of ships was reduced from seven to three. Restructured program achieved new MS B in October 2010.**
- **The restructured program eliminated the Volume Search Radar from the program and moved IOC from FY15 to FY16.**
- **Revisions to the program's schedule shifted IOT&E to the right by almost 2 years.**

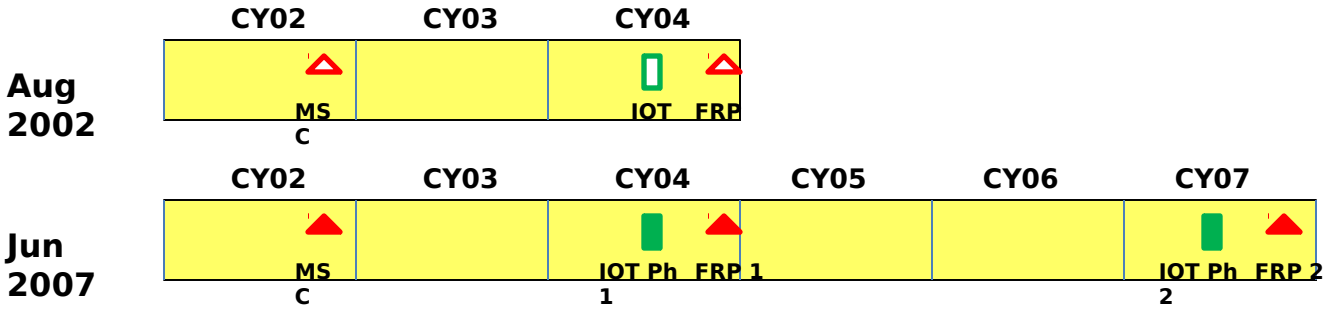
Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Outline

- Air Warfare Examples
- Naval Warfare Examples
- Land Warfare Examples
- Net-Centric Examples
- Missile Defense Example

CH-47F Chinook Cargo Helicopter

Army heavy lift helicopter that provides combat resupply and transportation for ground forces. Digital cockpit was key new feature.

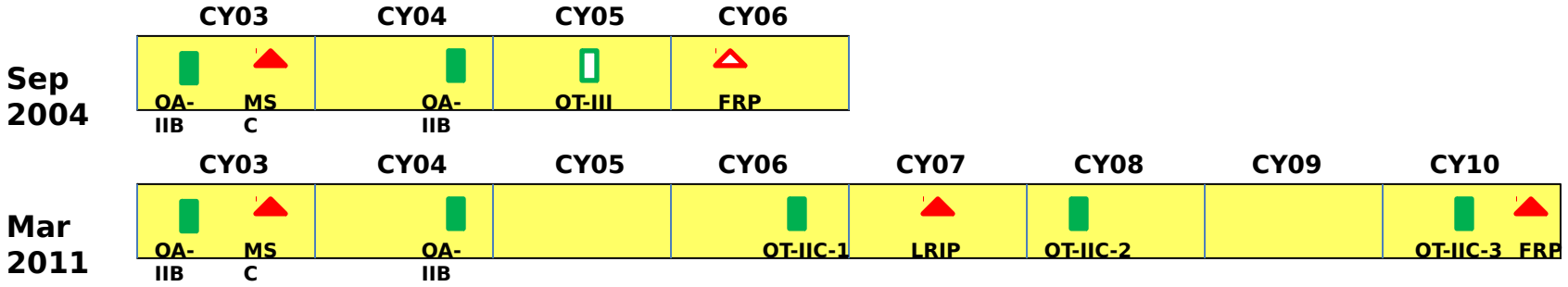


- **Reliability problems discovered in developmental and operational testing**
  - Program not funded or structured for reliability growth
- **In IOT Phase 1, Helicopter was effective, but not suitable**
  - Did not meet two of four reliability requirements
  - Could not send/receive digital messages as required by KPP
  - Airframe fatigue cracking prevalent throughout the fleet
- **Army merged this program with Special Operations MH-47G program**
  - Approved FRP for Lots 1 – 5
  - Production line front-loaded with 46 MH-47G aircraft; one CH-47F of this design produced for Army
- **Army then redesigned cockpit, avionics, and airframe**
  - All-digital displays, flight controls, and avionics (initial design had been a mix of analog and digital)
  - Funded for reliability growth
  - New monolithic frames for fuselage
- **Effective and Suitable at IOT Phase 2**

Proposed Test Event | Completed Test Event | Proposed Decision | Completed Decision

USMC AH-1Z Attack Helicopter

Upgrades and extends life of existing fleet of USMC Cobra helicopters with digital cockpits and four-bladed rotors

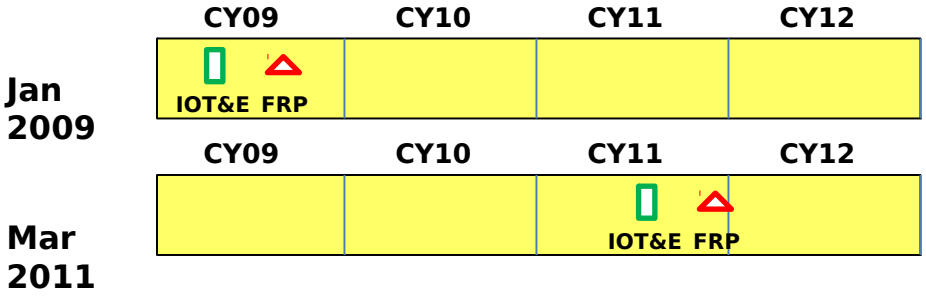


- **IOT Phase 1 (OT-IIC-1) delayed by technical difficulties with hydraulic system, composite rotors, integrated helmet, and integration of targeting sensor**
  - **OT with "production-representative" EMD aircraft and targeting sensor; not LRIP items**
  - **AH-1Z effectiveness limited by poor Targeting System reliability, excessive pilot workload, poor performance of integrated helmet, and rocket delivery restrictions**
  - **Navy continued in LRIP, scheduled IOT Phase 2**
- **In IOT Phase 2 (OT-IIC-2), AH-1Z reliability (primarily Targeting System failures) was so poor that the Navy terminated AH-1Z testing**
  - **OT with "production-representative" EMD aircraft and targeting sensor; not LRIP items**
  - **Navy shifted most LRIP quantities to UH-1Y variant and scheduled IOT Phase 3**
- **In IOT Phase 3 (OT-IIC-3), AH-1Z was effective and suitable**
  - **OT with LRIP aircraft and targeting sensor**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Vertical Take-off and Landing Unmanned Aerial Vehicle (VTUAV)

Provides the Navy a ship-based, tactical, ISR asset

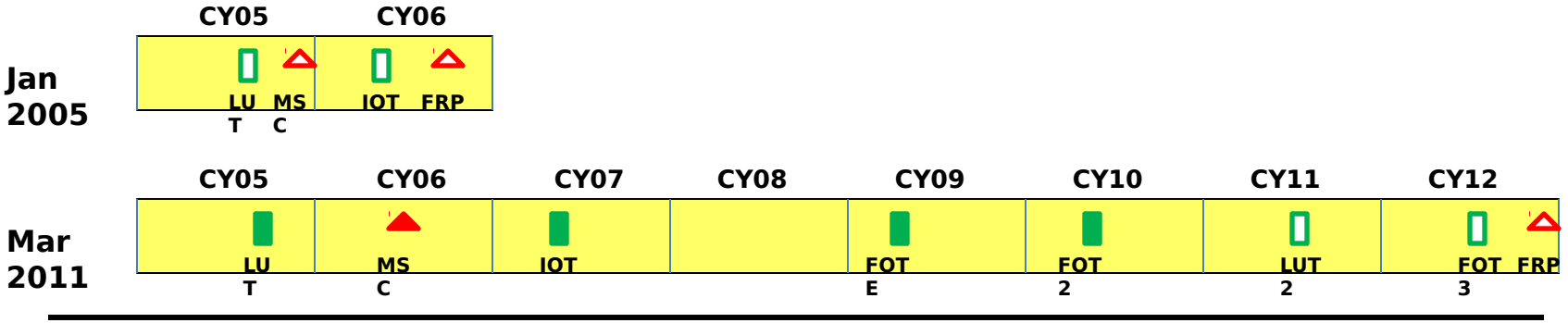


- **Schedule originally tied to Littoral Combat Ship fielding**
- **Suitability issues reported in the April 2009 "Developmental Test to Operational Test Transition Report" delayed start of June 2009 IOT&E**
  - Excessive Operational Mission Failures (MTBOMF = 15.1 versus threshold value of 30.0)
  - Numerous False Alarms (Mean Time between False Alarm = 0.8 hours versus threshold value of ≥ 4.0 hours)
- **Implementing threshold capabilities required more software drops than anticipated**
  - Four major software versions in 2005 to nine versions in 2011
- **Lost-link events in December 2009 and August 2010 required additional software testing and upgrades**
- **Recently proposed September 2011 start to IOT&E likely to be further delayed**
  - Program has one set of shipboard Ground Control Station equipment
  - Single set deploys with ships for Military Utility Assessments – if system is not ready for IOT&E before ship sails, IOT&E is further delayed

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Spider Networked Munition

A non-persistent anti-personnel landmine system

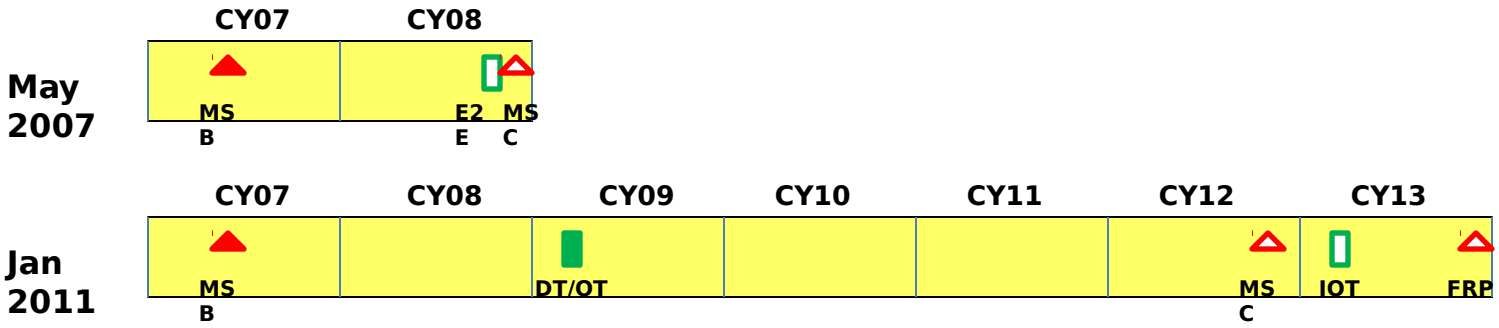


- **FRP has been delayed 6 years due to poor performance**
- **In developmental testing, the system demonstrated technical parameters**
- **In operational testing, soldiers have not been able to operate and sustain the system**
  - September 2005 LUT: Limited operational environment → Effective w/limitations but Not Suitable
  - April 2007 IOT: Adequate operational environment → Not Effective and Not Suitable
  - March 2009 FOTE: Adequate operational environment → Not Effective and Not Suitable
  - May 2010 FOT2: Adequate operational environment → Effective but Not Suitable
- **Recurring deficiencies**
  - Effective fighting of a Spider field requires a unit well trained in non-Spider specific soldier and unit skills
  - Prior to FOT2, test units could not effectively operate the system to produce threat casualties
  - System C2 software is complex and difficult to operate
  - Operator C2 errors consistently result in missed requirements for reliability and component reuse
- **Urgent fielding of 66 systems occurred in 2009, but nearly no use of the system has been reported**
- **Software upgrades are being incorporated and training enhancements implemented**
  - Future testing includes a reliability-focused LUT2 and a full operational test in FOT3
  - Future testing will support a DOT&E BLRIP Report and FRP decision in late 2012

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Precision Guidance Kit (PGK)

An artillery fuze providing GPS guidance for 155mm high explosive projectiles

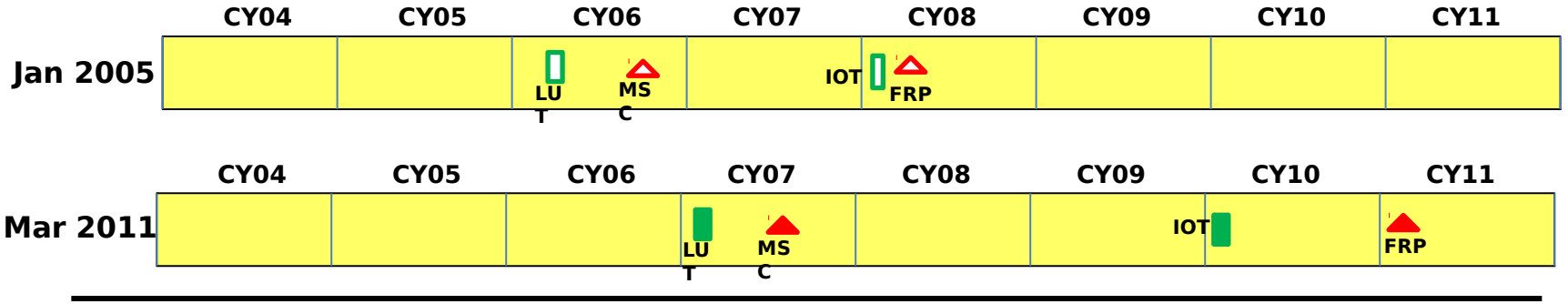


- **MS C has been delayed 4 years because the system experienced performance and reliability problems in developmental testing**
- **The May 2007 TEMP's 18-month developmental schedule (May '07 – November '08) was acknowledged by MDA to be "aggressive"**
- **In developmental testing:**
  - Demonstrated reliability in 2009–2010 testing was 63% versus the planned growth curve value of 87%
  - Extensive failure analyses indicated the need for design changes and additional performance testing
- **In January 2011, a re-baselined program was approved by the Army Acquisition Executive**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point | E2 E End-to-End Firing Demonstration

Excalibur Increment Ia-2

An extended-range, GPS-aided, precision 155mm artillery projectile



- **FRP was delayed 33 months due to reliability problems and programmatic changes**

- **MS C was delayed 9 months because of reliability problems in developmental tests**
  - Assessed reliability in December 2006 was 73% versus an 85% requirement

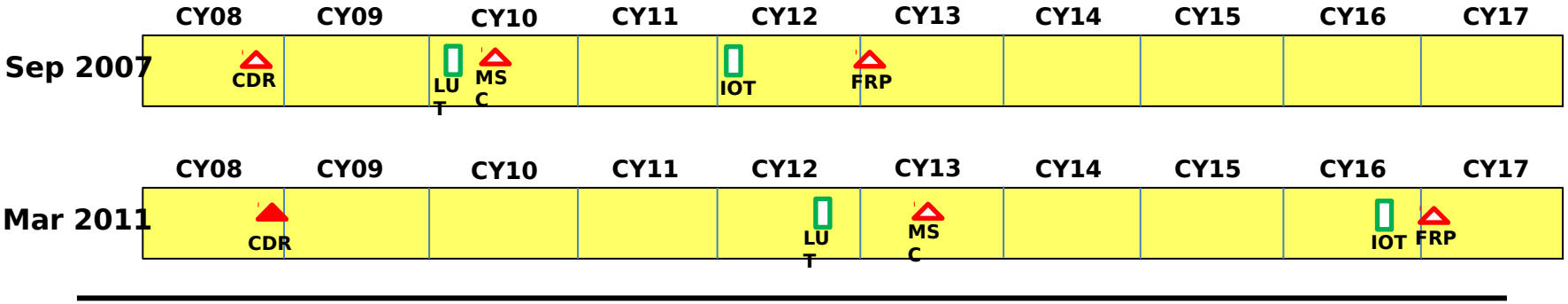
- **The IOT was delayed an additional 15 months because of reliability problems that surfaced in developmental testing and a change in the threat**
  - Replaced Inertial Measurement Unit vendor to improve reliability
  - Change in description of the GPS jamming threat required redesign of GPS antennas on the projectile
  - Reliability problems continued with top propellant charge in IOT (50%)

- **The FRP decision was further delayed 9 months because of a Nunn-McCurdy breach triggered when the Army reduced the acquisition objective from 30,000 to 6,264 rounds**

Proposed Test Event | Completed Test Event | Proposed Decision | Completed Decision

Paladin Integrated Management (PIM)

A Service Life Extension Program for the Paladin self-propelled howitzer and ammunition carrier

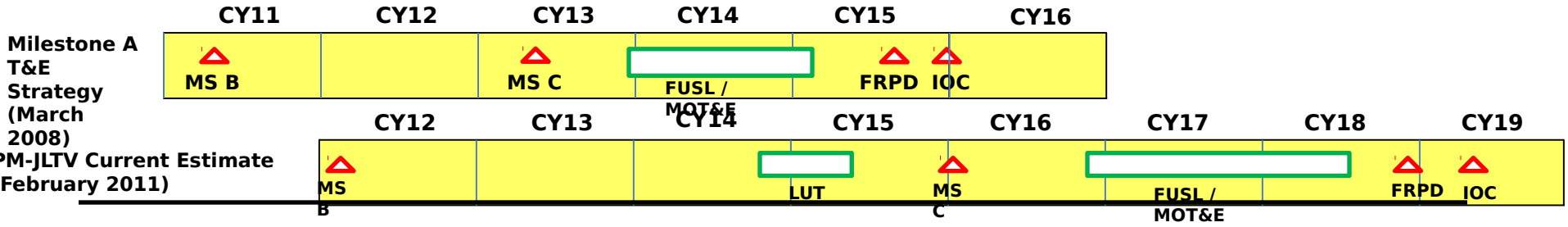


- **FRP has been delayed 4 years due to optimistic initial expectations, technical and management issues, and programmatic changes**
- **Program Office's initial schedule was optimistic**
  - Assumed immediate contract award was possible
  - Assumed prototypes could meet reliability requirements as soon as delivered so no reliability growth plan needed
  - Assumed prototype deliveries could be made by 3QCY09
- **Technical and management issues became apparent during prototype development**
  - Prototype reliability below expectation in contractor checkouts
  - Poor communication of survivability requirement to contractor required design changes and delay in commencement of Ballistic Hull and Turret test
  - Expected prototype deliveries for government testing have been delayed approximately 21 months to 2QCY11
  - Delivery of IOT LRIP test articles now expected to take 36 months from MS C
- **Programmatic changes have delayed initiation of a viable program schedule**
  - Army Acquisition Objective change raised PIM to ACAT ID, increasing documentation requirements
  - Army seeking JROC approval to reduce reliability KPP threshold from 0.81 to 0.75 probability of mission completion

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Joint Light Tactical Vehicle (JLTV)

HMMWV replacement with improved capabilities



- **Milestone B has been delayed from March 2011 to January 2012 (10 months)**
  - Four-month delay in contract award (July 2008–October 2008)
  - Three-month delay after contract award was protested (November 2008–February 2009)
  - Three-month delay attributable to requirements refinements, to include changes in required Force Protection levels

    > Developmental test results illuminated the types of requirements refinements and capability tradeoffs that are necessary, particularly with respect to transportability, mobility, payload, reliability, and force protection

- **Milestone C has been delayed from April 2013 to January 2016 (33 months)**

  –Engineering and Manufacturing Development Phase was expanded to 48 months from planned

  24 months to allow:

  > More complete contractor systems engineering processes/baselines

  > Adequate time for design/manufacture, including more extensive component/sub-component qualification

  testing and longer contractor shakedown testing

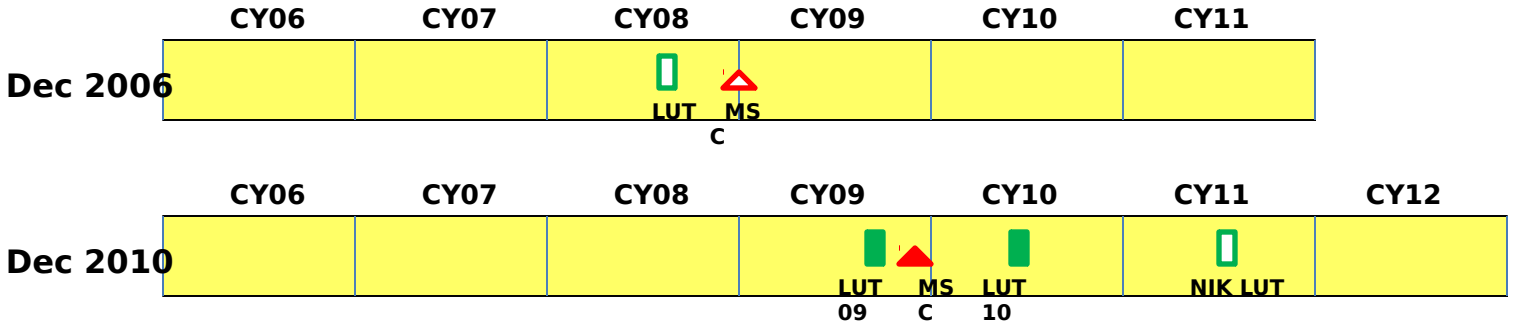
  –Ten-months of the 33 months delay caused by delay in Milestone B

FUSL: Full Up System Level Live Fire Test and Evaluation
MOT&E: Multi-service Operational Test and Evaluation
LUT: Limited User Test
FRPD: Full-Rate Production Decision

Proposed Test Event **Proposed Decision**

Early Infantry Brigade Combat Team (E-IBCT)

A collection of sensors and communications to improve situational awareness of infantry brigades

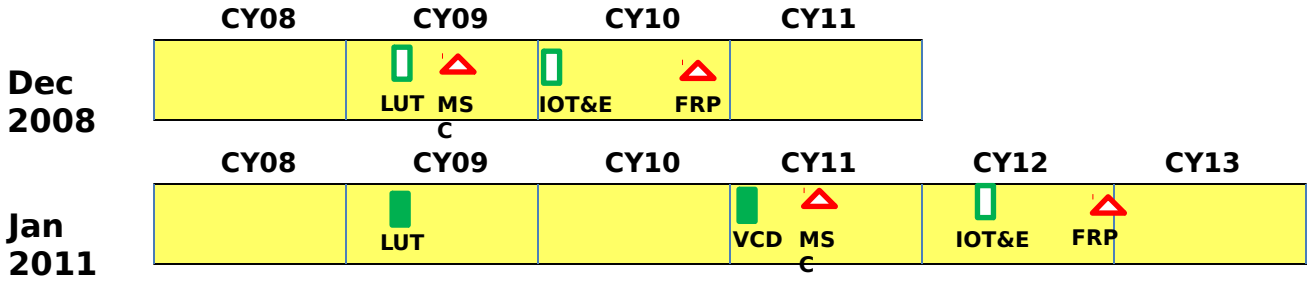


- **Planned FCS Spin-Out (Dec 2006 FCS SAR)**
  - LUT in Jun 2008
  - MS C in Jan 2009
- **Due to programmatic changes, LUT in CY08 was cancelled.**
  - Systems not ready for test
  - Focus shifted from HBCT to IBCT
- **As a result, MS C slipped one year from Jan 2009 to Dec 2009**
- **LUT in Sep 09 revealed significant reliability issues**
- **ADM in Dec 2009 approved purchase of one brigade set of each of the five sub-systems**
  - T-UGS, U-UGS, Class I UAS, SUGV, and NIK
- **LUT in Sep 2010 revealed improved reliability, but lack of military utility on part of several of the sub-systems**
- **ADM in Dec 2010 cancelled three sub-systems, approved two others; cancelled E-IBCT program**
  - T-UGS, U-UGS and Class I UAS cancelled
  - SUGV approved for two brigade sets
  - NIK approved for one additional brigade set and continued development
  - NIK LUT to be held in Jun 2011

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

JTRS Handheld Manpack and Small Form Fit (HMS) Rifleman Radio

A platoon, squad and team level command and control radio capable of IP-based voice and data transfer

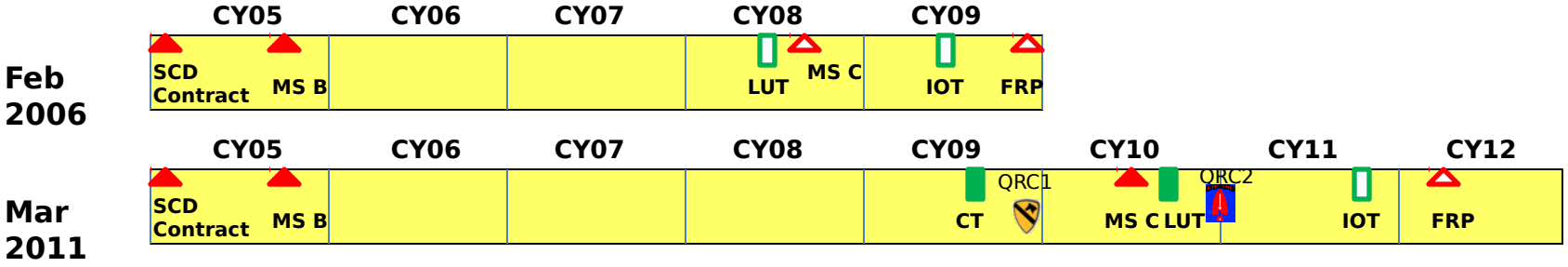


- **The Milestone C and following events have been delayed about 2 years.**
- **Major performance deficiencies in the system (reliability, range, battery life, thermal rise and immature doctrine) were identified at the April 2009 Limited User Test (LUT).**
- **The program office initiated a complete hardware redesign. This required a set of governmental developmental testing and a Verification of Correction of Deficiencies (VCD) test for January–February 2011.**
- **Preliminary analysis of the VCD data indicates the system performance is improved over what was observed at the LUT.**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Gray Eagle Unmanned Aircraft System

Provides the Army Division Commander with unmanned Reconnaissance, Surveillance, Security, Attack, and Command and Control Capabilities

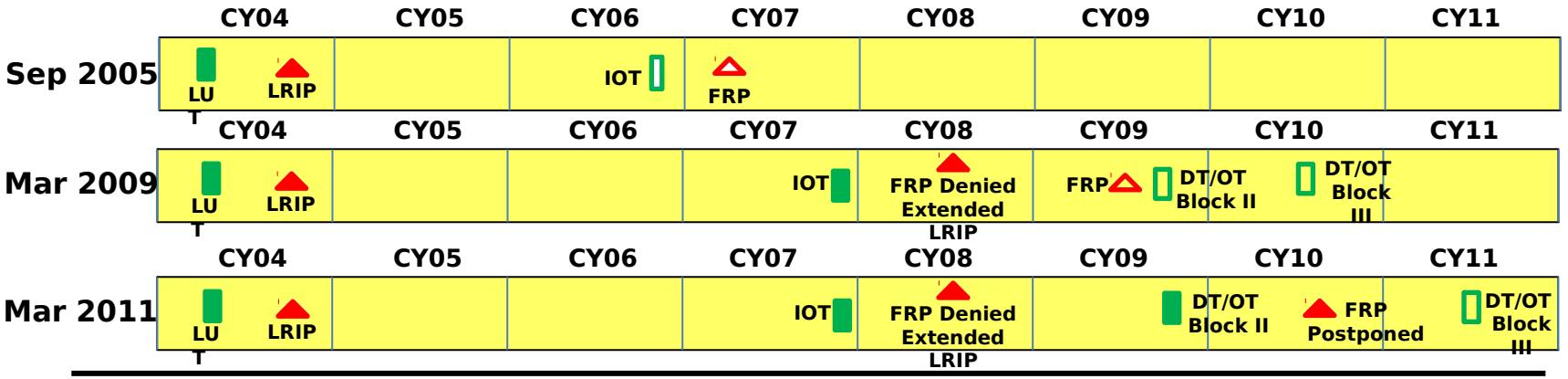


- **FRP decision has been delayed more than 2 years because of requirements changes between MS B and MS C and ISR surge**
- **Requirements change after MS B**
  - **Originally Corps-level intelligence asset, now a Division-level armed reconnaissance/attack asset**
  - **Originally contractor maintenance concept, now a 100% soldier maintenance concept**
  - **Increase in system capability requirements**
- **SECDEF direction in March 2008 to support the ISR surge requirement**
  - **Deployed Quick Reaction Capability 1 to 1st Cavalry Division in July 2009**
  - **Deployed Quick Reaction Capability 2 to Special Operations Command in September 2010**
- **Customer Test and LUT performed in conjunction with fielded unit training rotations**
  - **Testing in conjunction with unit training certification added no additional time to the rapid fielding schedule**
- **Both early operational tests were beneficial**
  - **Provided the program insights into reliability issues**
  - **Demonstrated operational capabilities of each quick reaction unit; both far short of full program of record requirement**
  - **Performance of deployed quick reaction units consistent with operational test results**
- **IOT currently scheduled for October 2011**
  - **Army working on training, personnel, and technical development issues**

Proposed Test Event **Completed Test Event** **Proposed Decision** **Completed Decision**

Stryker Mobile Gun System (MGS)

A variant of the Stryker family equipped with a 105mm cannon



- **FRP delayed 2 years due to performance issues identified in operational testing and initial deployment**
- **Secretary of Defense deployment waiver listed 23 performance deficiencies (sights, secondary weapons, reliability, survivability) identified in BLRIP to be corrected before FRP**
- **FRP postponed until Stryker Modernization to correct remaining deficiencies**
- **Operational Testing has continued to demonstrate reliability and other issues**
  - April 2004 LUT: Limited operational environment → Demonstrated wall breach KPP but poor reliability
  - Oct-Nov 2007 IOT: Adequate operational environment → Effective for small-scale contingencies; suitable with deficiencies; survivable in some operational scenarios
  - July 2009 DT/OT: Limited operational environment → Demonstrated corrective action for 12 of 23 deficiencies
  - Sep 2010 DT/OT: Postponed to June 2011 due to quality problems on Extended LRIP vehicles
- **Ongoing Actions**
  - Reliability remains poor; demonstrated 10 MRBSA in the LUT against a requirement of 81 MRBSA
  - IOT delayed for a year due to reliability growth program; IOT demonstrated 53 MRBSA
  - Block III Validation of corrective action for deficiencies delayed for one year due to stop work order issued as a result of several production quality problems identified in contractor shakedown testing

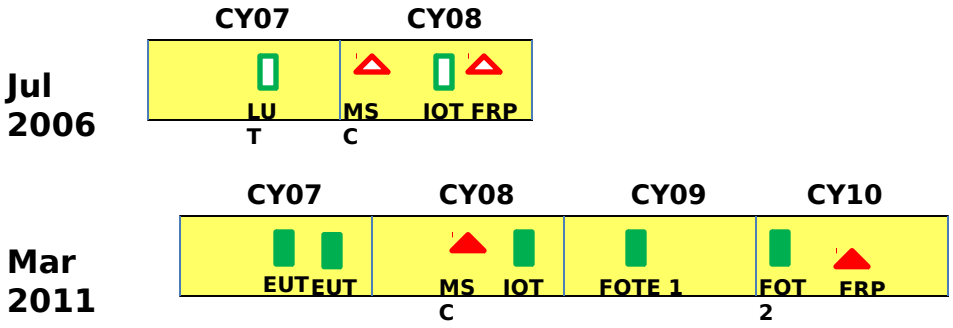
Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Outline

- Air Warfare Examples
- Naval Warfare Examples
- Land Warfare Examples
- Net-Centric Examples
- Missile Defense Examples

Net-Centric Enterprise Services (NCES)

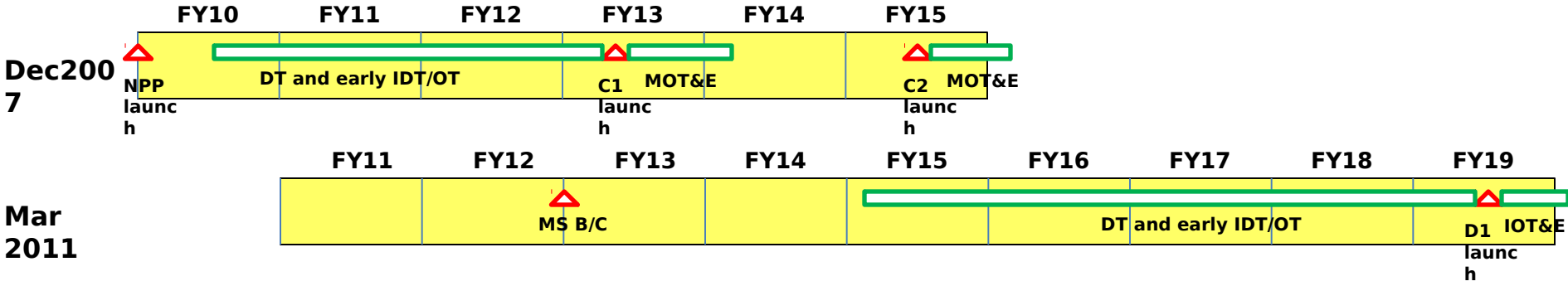
DoD Enterprise-level services for Collaboration, User Access, Content Discovery & Delivery, and Service Oriented Architecture Foundation Products



- **FRP was delayed 2 years because there was a change in the acquisition strategy**
- **Technical parameters were initially demonstrated in Developmental Testing**
- **During OT, users had difficulty operating and sustaining various services**
  - July 2007 EUT: Limited operational environment → Effectiveness/Suitability Undetermined
  - Sept 2007 EUT: Limited operational environment → Effectiveness/Suitability Undetermined
  - March 2009 FOTE 1: Inadequate operational environment → Effectiveness/Suitability Undetermined
  - Feb 2010 FOT 2: Adequate operational environment → Effective and Suitable with Limitations
- **Factors contributing to delay**
  - Programmatic changes after Milestone B, including replacement of managed service providers of core enterprise services, significantly delayed the program.
  - OT events identified widespread audio and video latencies and session drop outs for Collaboration services.
  - Immature policies, processes, and procedures, combined with an absence of end-users, limited the ability to assess the intended purpose of NCES service oriented architecture foundation services.
  - Problems conducting the test due to an extremely limited user base for many services precluded an assessment of scalability to the levels envisioned in the CPD .

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Weather Satellite with Ground Support



- **NPOESS program was delayed more than 4 years and then terminated because of issues discovered in contractor testing, primarily identifying performance shortfalls.**
  - 2003-2005: Production failures plagued the visible-infrared imaging radiometer suite and the ozone sensor
    - Consumed 96% of program funds by 2005
  - 2003-2007: budget cuts adversely impacted developmental effort
  - Other delays primarily due to management issues (several GAO reports on this).

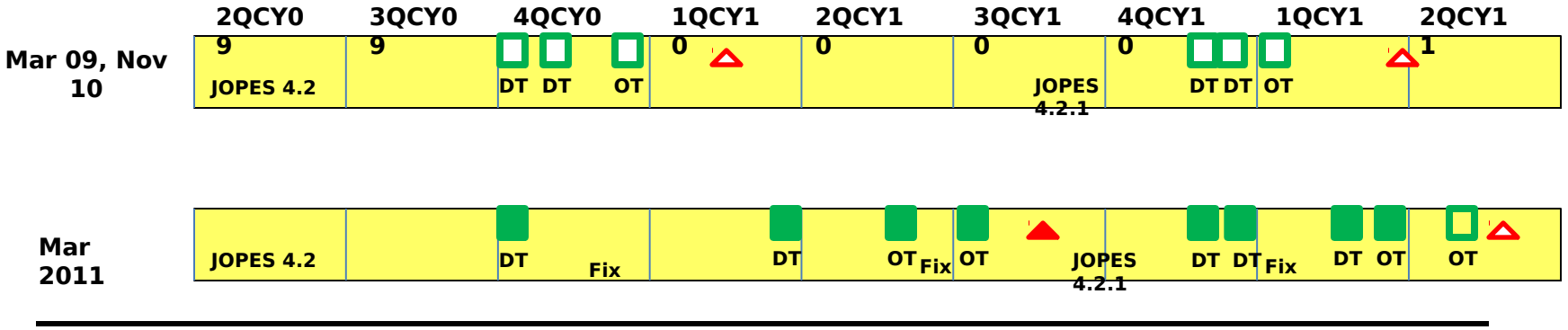
- **NPOESS was granted a combined Key Decision Point B/C in 2002, with no provision for the remaining Build Approval Milestone, thus no Milestone proposed.**

- **In March 2010, the NPOESS program was split into DoD and non-DoD portions, with the DoD portion now designated as the Defense Weather Satellite System (DWSS), currently awaiting Material Development Decision.**

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Global Command and Control System (GCCS) JOPES 4.2 and 4.2.1

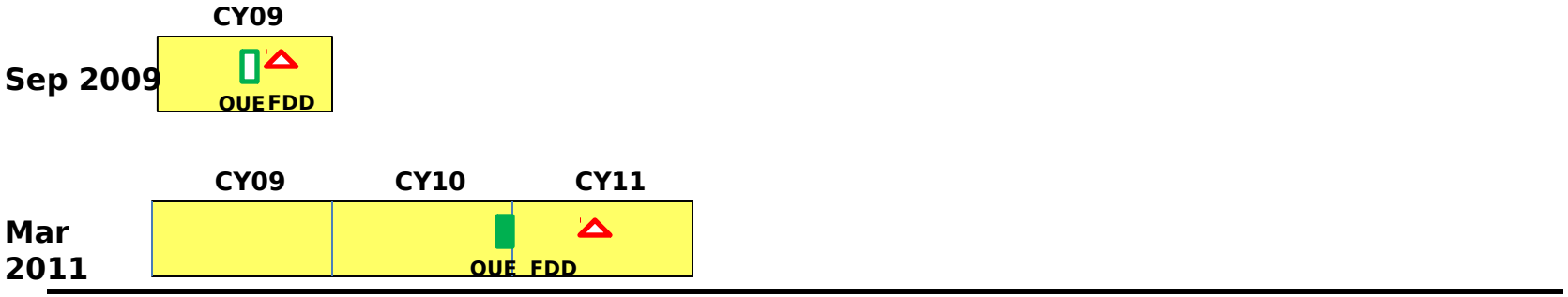
Planning and Execution System for Joint Task Forces



- **Joint Operations Planning and Execution System (JOPES) 4.2 initial DT failure delayed planned second DT event with user participation by 6 weeks**
  - Significant fix period delayed second DT test event
- **Failures in JOPES 4.2 OT required a fix period, followed by a re-test that was successful**
  - Users accepted remaining software problems and recommended fielding
- **JOPES 4.2.1 has not yet completed OT**
  - Second OT event is required due to BRAC move of FORSCOM
  - Additional testing scheduled for May 2011

Combat Information Transport System (CITS)
Air Force Intranet (AFNet) Increment 1

A System to Provide a Centrally Managed Air Force Enterprise Network



- **In CY09, seven of 16 planned gateways were deployed for testing on Air Force unclassified operational networks. Deficiencies found in testing have delayed deployment by about 2 years**
- **Factors contributing to delays**
  - Some operational parameters were not met during developmental testing (e.g., 800 Mbps data throughput capability at gateway)
  - Challenge of *in situ* transition from 32-bit to 64-bit architecture
  - Modernization of interdependent **AFNet Inc 1** components **required additional** developmental testing
- **CY09 testing identified deficiencies that delayed Operational Utility Evaluation to Dec 2010**
- **The deployed gateways are operational, but with significant limitations related to Information Assurance and Cyber Defense**
- **Full Deployment Decision Review is planned in June 2011**
  - Fielding decision will require Milestone Decision Authority to accept risks
  - PEO is proposing to reduce some requirements such as on-line data back-up capability

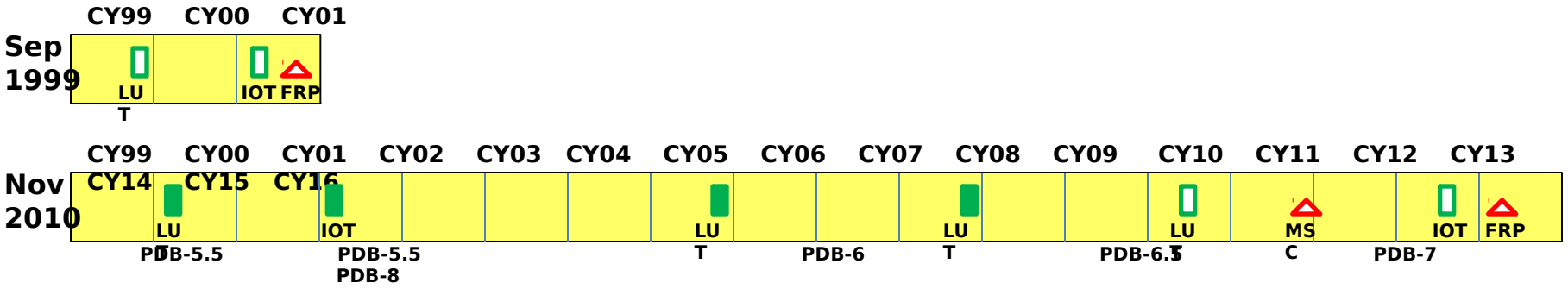
Proposed Test Event **Completed Test Event** **Proposed Decision Point** **Completed Decision Point**

Outline

- Air Warfare Examples
- Naval Warfare Examples
- Land Warfare Examples
- Net-Centric Examples
- Missile Defense Examples

Patriot Advanced Capability-3 (PAC-3) System

A System to Defend against Aircraft and Missile Attacks

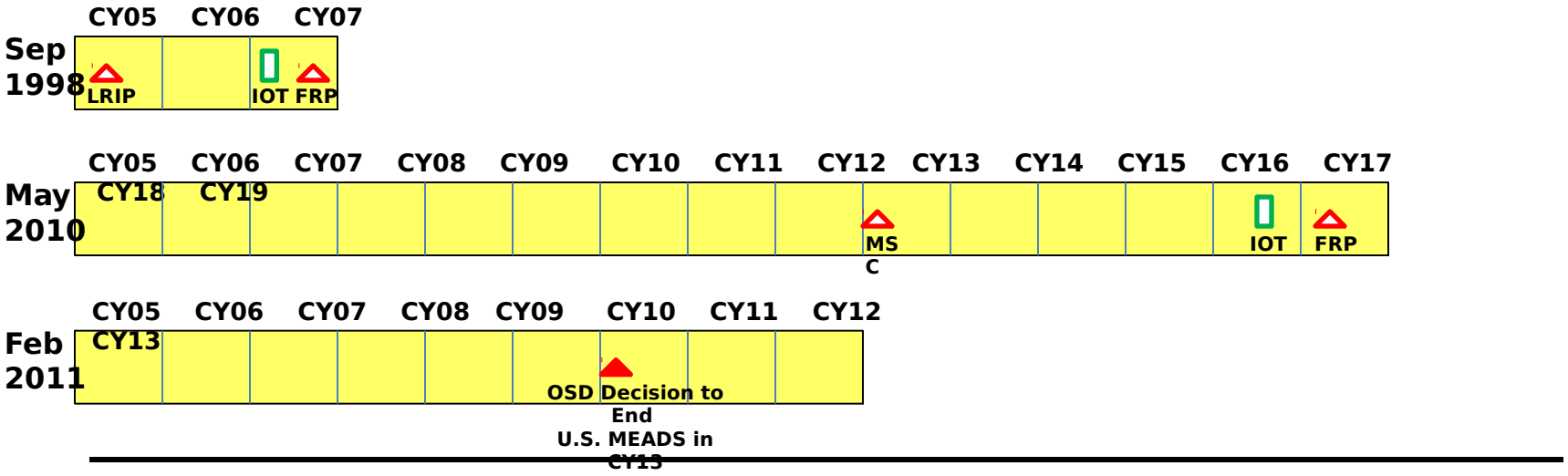


- **Patriot PAC-3 Full-Rate Production has been delayed by 15 years so far**
  - PAC-3 Configuration-3 IOT&E in 2002 revealed that Patriot did not meet all its Key Performance Parameter threshold requirements
  - The FRP decision was deferred and the program has made two-year missile purchases since then
  - Patriot showed good performance against simple Iraqi tactical ballistic missiles during Operation Iraqi Freedom in 2003 (as predicted by IOT&E), but Patriot units also shot down two friendly aircraft and killed three Allied airmen
  - The Army has modified Patriot system software to address problems revealed in IOT&E and OIF and has operationally tested each major system software drop (Post-Deployment Build or PDB) in Limited User Tests
  - The Army is developing the Missile Segment Enhancement (MSE) interceptor to address some of the problems Patriot has in meeting its KPP threshold requirements
  - The MSE LRIP decision is scheduled for 4QCY13 and the FRP decision is scheduled for CY16 (after a CY15 IOT&E)
  - The CY16 FRP will be a system-level decision since the original PAC-3 Configuration-3 FRP was deferred
- **Patriot PAC-3 FRP has been deferred for both technical and programmatic reasons**
  - Patriot has not been able to meet all its KPP threshold requirements during operational testing
  - The Army has been able to purchase and field PAC-3 missiles using two-year buys without having to go to "full-rate production"

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Medium Extended Air Defense System (MEADS)

A System to Defend against Aircraft and Missile Attacks



- **MEADS has experienced technical and management challenges since the 1990's**
  - MEADS is an international co-development program between the United States, Germany, and Italy
  - Some program delays were caused by the three nations shifting funding to later years
  - Most program delays were caused by technical problems in designing and developing the system
  - In November 2010, the NATO MEADS Management Agency indicated that the program was slipping another three years and would require an additional $1 billion of U.S. funding (on top of the $1.5 billion spent to date, the $800 million scheduled to be spent through 2014, and at least $800 million required to complete U.S.-unique development, integration, and testing)

- **In February 2011, OSD decided to end U.S. MEADS participation in CY13**
  - OSD plans to fund MEADS design and development until the current cost ceiling is reached
  - The United States does not intend to purchase MEADS

Proposed Test Event | Completed Test Event | Proposed Decision Point | Completed Decision Point

Conclusions

- Problems in conducting tests occasionally contributed to program delays, but problems found during both DT and OT testing frequently caused program delays
- Programmatic problems were also common